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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/804,158	03/13/2001	Susumu Kawada	57454-037	8619

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EXAMINER

SAGAR, KRIPA

ART UNIT	PAPER NUMBER
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1756

DATE MAILED: 03/11/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/804,158

Applicant(s)

KAWADA ET AL.

Examiner

Kripa Sagar

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1756

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 December 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-7,15-62 and 66-71 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7,15-26,38-44,60-62 and 66-71 is/are rejected.
- 7) ☒ Claim(s) 27-37 and 45-59 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 3/13/01 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Applicant's request for reconsideration of the previous office action is noted. Claims 1-7, 15-62, 66-71 are under consideration.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this

Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1-7, 15-26, 38-44 are rejected under 35 U.S.C. 102(b) as being anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over US Pat. 5635315 to Mitsui ('315 reference).

The instant claims recite a phase shift film, a phase shift mask (PSM) blank and a phase shift mask wherein the film is deposited by a long throw sputtering device.

Mitsui (col.1;line.5 – col.7;line.44) teaches a phase shift mask (PSM) film, mask blanks and a PSM wherein the phase shift film comprises Mo,Si,O and N (2;47-4;8 & fig.5). Thus Mitsui teaches the elements of claims 1,15,38. which recite a film, a mask blank and a mask. Applicant has not claimed unique structures for the film. A blank or a mask comprising the film has not been shown to be structurally different from those of the '315 reference. Claims 2-7,16-26,39-

44 recite the methods of forming the film and do not further characterize the products claimed.

The method of forming the products is accorded little weight in these product-by-process claims where no structure or unique function is recited. Mitsui does not teach that the films are formed by a long throw sputtering device or method; however a MoSiON film formed by any method would function as well as the instant film, blank or mask.

3. Claims 60,61,62 are rejected under 35 U.S.C. 102(b) as being anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over US Pat.5942356 to Mitsui et al. ('356 reference)

The claim recites an exposure method using a PSM with a MoSiON film formed by long throw sputtering. Semiconductor devices are manufactured using the PSM.

Mitsui (col.1;line.5 – col.13;line.10) teaches an exposure technique using a PSM with a MoSiON film (17;6—18;36). The film is not formed by long throw sputtering – however the exposure technique would be equally successful with any phase shift mask having any phase shift feature formed by any method.

It teaches forming semiconductor devices using the PSM with MoSiON film (18;37-20;34). The devices are not formed, using the PSM with a film deposited by long throw sputtering – however the devices would function as well as that of the instant claim irrespective of the method of manufacture.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 66-71 are rejected under 35 U.S.C. 103(a) as being unpatentable over the '315 reference in view of the '356 reference and further in view of US Pat.5605776 to Isao et al. cited by Applicant.

The instant claims recite film thickness and optical characteristics. Two-layered films are also recited.

The '315 reference teaches a phase shift film of the instant invention.

The '356 reference teaches a method of depositing MoSiON phase shifting films by reactive ion sputtering. The '356 reference teaches that the optical characteristics of the film can be adjusted (2;43-3;3) and teaches compositions and optical characteristics (T% and n) of films (figs.7,8). This is reinforced by the teachings of the '315 reference shown in Table 1 (col.5).

The '356 reference does not teach multi-layered films.

Applicant cited prior art teaches that two-layered MoSiON phase shift films are conventional and known in the art. The thickness and the optical characteristics are adjusted to the radiation used (Isao:1;8-2;36). Isao's improvements comprise adjusting the composition of the film and using multiple layers with an average composition (3;15-4;29).

One of ordinary skill in the art at the time the invention was made would adjust the film forming conditions taught by the '315 and '356 references to arrive at the designed characteristics because both references teach the same method of solving the same problem – viz. the adjustment of the film characteristics to the radiation used ('356: 2;28-43 & '315: 7;16-26). The motivation for forming plural layers as taught by Isao arises from the reference teaching that the plural layers minimize lateral etching, thereby providing mask features with vertical sidewalls. This results in more accurate pattern transfer (3;8-14).

Allowable Subject Matter

7. Claims 27-37, 45-59 are allowed.

8. The following is an examiner's statement of reasons for allowance:

Independent claims 27 and 45 recite the process steps for making mask blanks and PSMs using long throw sputtering.

The phase shift films of the instant claims are known in prior art as taught in the '315 and '365 references. Long throw sputtering is a known variant of conventional sputtering techniques used in the '315 and '365 references. This is also admitted prior art (spec:p.2;23-30). However the application of long throw sputtering *techniques* to the films taught by the '315 and '365 references would require considerable experimentation. Applicant's data and comparative examples are evidence of this.

Claims 28-37 and 46-59 are allowable at least for their dependence from claims 27 and 46.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Response to Arguments

9. Applicant's arguments presented 12/15/03 have been considered.

Applicant's arguments regarding combination of certain references has been persuasive and accordingly claims 27,45 are allowed.

Applicant's arguments with reference to claims 1-7,15-26,38-44,60-62,66-71 will be addressed below. The arguments below are intended to aid the Applicant in his/her response.

Independent claims 1,15, 38 recite a generic phase shifting film, a PSM blank and a PSM; the dependent claims limit the *method of making* the film on these products -- viz. long throw sputtering. Claims 66-71 recite the optical characteristics of the film.

Claim 60 recites an exposure method using a PSM with a phase shift film formed by long throw sputtering. Semiconductor devices are manufactured using the PSM [cl.61,62].

It is to be emphasized at the outset that the unobvious element of the invention is a *method* of forming a phase shifting film and should be so claimed.

Applicant does not and in fact cannot claim a phase shift film *per se* since these are known as shown above; further it is admitted as prior art by Applicant and in Applicant cited reference to Isao.

Applicant does not and in fact cannot claim to have invented long-throw sputtering *per se*. This has been known in the art as shown in the previous rejections and may be readily verified. It is also admitted as prior art by Applicant (specification: p.2;l. 23-30).

It is shown below that Applicant has not structurally distinguished the phase shift film, the mask blank or the phase shift mask from prior art film, blank or mask; the assertions of improved physical and optical properties are not convincing.

Applicant has argued (instant remarks; p.3) that the cited references do not teach each element of the product-by-process claims and hence a rejection under 35USC102 is not sustainable. The courts and the case law are clear on this. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985).

Further, a *prima facie* case is made when it is shown that a claimed product is the same or similar to that of the prior art (MPEP-2113). In this instance the generic *film as claimed*, the generic *mask blank as claimed* and the generic *PSM as claimed* are similar in structure and function to those taught by

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the cited references. Note that the *claims* do not recite any *unique structure or function*. Note further that the dependent claims do not recite any unique structure or function of the products but instead only limit the process of making. It is incumbent on the Applicant to come forward with the evidence establishing an unobvious difference between the claimed product and the prior art product. *In re Marosi*, 710 F.2d 798, 802, 218 USPQ 289, 292 (Fed. Cir.1983). Applicant has not done so.

Applicant has further argued (p.3-p.4) that Examiner has not shown that the products of the cited art are identical to those of the instant claims. Applicant proceeds to assert that the *structure of the film* formed by long throw sputtering is different from that of the prior art film and results in improved physical and optical characteristics.

Applicant's statements on the benefits of using the long throw sputtering are not substantiated. Applicant states, for example, that the density and refractive index of a film formed by the instant method are greater than those of prior art (p.4). Applicant provides no data on the film density. The refractive index (n) of the films formed by the '356 reference ('356: Table ,5,7,8) are within the range claimed in the instant invention [cl. 66-71] and comparable in value to those listed in instant tables 6,8,9. Further the '315 reference teaches that these values may be adjusted by adjusting the compositions of the film ('315:6;67-7;9). Comparison of Applicant's own data (tables 6,8,9 and 11,13) fails to reveal any significant differences in the refractive index. Applicant claims that the transmittance of the films formed by the instant method is greater than that of the

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prior art film for lower wavelengths. Applicant's data (see for example Table 6 and 11) suggests that in the as deposited condition the transmittance of the T07 film (thickness 1045A) is comparable to that of the Q1-4 film which has a similar thickness. The '315 references teach that the transmittance is a function of the nitrogen and oxygen contents of the film and is independently adjustable, with little effort, by a person of ordinary skill ('315:7;8-9). Similarly Applicant's argument with respect to the oxidation of the sputtering target is not backed by any data. Finally the '315 reference teaches adjustment of the oxygen and nitrogen contents of the film to form films with various transmittance using conventional deposition ('315;5;1-32). In summary, Applicant's arguments are not persuasive and are mere unsubstantiated allegations.

With respect to the rejections of claims 60-62 Applicant engages in the same argument presented earlier with respect to claims 1,15,38.

Claim 60 recites an *exposure method* using a phase shift mask comprising a phase shift film formed by the instant method. The *generic exposure method as claimed* does not disclose any unique operation nor does it reveal any unexpected results. In order to be given weight to the structure used in a methods claim the recited structure limitation must affect the method in a manipulative sense (*ex parte* Pfeiffer, 1962 C.D. 408 (1961)). '315 reference and the '356 reference both teach conventional exposure methods well known in the art. A person of ordinary skill in the art would recognize the inherent steps of conventional lithography recited in these references. Stated plainly, Applicant has not shown how an exposure method using a phase shift mask comprising a

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film formed by the instant method would manipulatively differ from the method taught by the references.

Claims 61 and 62 recite *generic devices* manufactured using a PSM comprising a film formed by the instant method. No unique features or functions of the devices are disclosed or claimed.

Examiner has made every effort to identify the patentable elements of the application and reminds the Applicant of the invitation from the prior office action which is reproduced below:

“Examiner recognizes that application of the LTS technique to the MoSiON target may not be as simple as changing the distance between the target and the source; it may require considerable experimentation and optimization of the deposition parameters. Applicant’s argument in this regard is persuasive. Applicant is invited to limit the claims to the instant invention: As understood, this includes : the *method* of depositing a *MoSiON* phase shifting film, with optical characteristics tailored for ArF and KrF radiations, using a *long throw sputtering* device with *separate gas inlets* for the reactive and inert gases and with the *process parameters* that the Applicant has invented. The *fabrication* of mask blanks and PSMs with similar limitations may be allowable. Products formed by the process and generic phase shift films or methods would not be patentable. “ (emphasis added)

It is regrettable that that the issues could not be resolved in a telephonic interview according to the invitation extended by the Applicant.

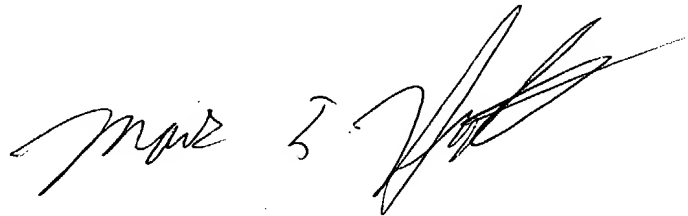
Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kripa Sagar whose telephone number is 571-272-1392. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark F Huff can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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